DOCUMENT RESUME

ED 290 463 IR 013 119

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TITLE CD-ROM for Educators. ERIC Digest.
INSTITUTION ERIC Clearinghouse on Information Resources, Syracuse, N.Y.
SPONS AGENCY Office of Educational Research and Improvement (ED), Washington, DC.
PUB DATE Sep 87
CONTRACT 400-85-0001
NOTE 3p.
AVAILABLE FROM ERIC Clearinghouse on Information Resources, 030 Huntington Hall, Syracuse University, Syracuse, NY 13244-2340 (free, while supply lasts).
PUB TYPE Information Analyses (070) -- Information Analyses - ERIC Information Analysis Products (071) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Bibliographic Databases; Computer Software; *Information Systems; Librarians; Microcomputers; *Optical Data Disks; *Reference Materials; Teachers
IDENTIFIERS ERIC Digests

ABSTRACT

This overview of CD-ROM (Compact Disk-Read Only Memory) technology covers technical specifications as well as applications of special interest to teachers, school administrators, and librarians. Materials available on CD-ROM disks are described, including a variety of reference works, and a directory of publishers/producers is provided. Issues of concern and trends are also briefly discussed, including new technologies that will permit the local addition of data and networking. A nine-item bibliography is provided. (EW)

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ERIC DIGEST

CD-ROM FOR EDUCATORS

The CD-ROM is a revolutionary information storage medium which is changing the way collections of print, visual images, audio, computer programs and video are being delivered. This digest will present an overview of CD-ROM for educators, including technical specifications, applications and trends.

CD-ROM: What is it?

CD-ROM stands for Compact Disk-Read Only Memory. (Although there is no agreement on the spelling of the word "disc/k", the information industry seems to be settling on disk, which will be employed herein.) Based on the same technology as compact audio disks, CD-ROM technology permits the digital recording of information in the form of sound (audio), still images, video, text files, and computer programs on the same disk. Information is permanently written on the disk and cannot be modified. A CD-ROM disk measures 4.72 inches (12 cm) in diameter, weighs 0.7 ounce and is capable of storing up to 550 megabytes of data. That is the equivalent of 1,500 floppy disks or about 220,000 pages of text. This medium provides greater storage capacity for textual information than for digitized images.

Digital information is encoded on a CD-ROM disk in a series of indentations and flat areas, called "pits and lands." The pits are burned into a glass master disk by a laser beam in a three mile long spiral which begins at the center of the disk. After a master disk is created, it is used to produce copies made of polycarbonate plastic. The data surface is sealed with a transparent plastic coating and a reflective aluminum base. A CD-ROM drive (or player) "reads" the disk through the use of a low power laser beam that makes no physical contact with the data surface.

Introduced by Philips/Sony in 1984, this technology is currently licensed to more than 100 companies internationally.

What equipment is needed?

Components of a CD-ROM system are a microcomputer such as the IBM PC, a CD-ROM drive with an interface card, a CD-ROM database, and software designed to access the particular database purchased.

The CD-ROM drive is attached to a microcomputer as a peripheral device. The interface card, which is specific to the brand of the drive, is placed in a vacant slot inside the computer and controls the computer's access to the CD-ROM. There are many brands of CD-ROM disk drives on the market, with Hitachi, Philips, and Sony being most common. These are compatible with IBM PC and IBM PC compatibles, Apple (with some modifications) and VAX. Systems may require a minimum amount of memory, such as 512K. Large databases may require a hard disk drive.

Each CD-ROM system comes with the software used to access the data on the disk. The potential exists for software that can be tailored to the type of information being provided and for the type of user targeted by the particular database. Because the field is relatively new, software is still being modified and developed to more accurately reflect the needs of users.

The Advantages of CD-ROM

CD-ROM disks are extremely durable, with a projected shelf life of 10 years or more. Since there is no physical contact with the disk, they do not wear out. Because the data are stored in digital form, information recorded on CD-ROM disks is readily accessible by microcomputers and may be transferred to other storage media such as floppy disks or paper.

The high density storage capacity makes CD-ROM an appropriate delivery medium for large collections of information, or databases, such as encyclopedia sets, periodical indexes, large dictionary sets, online catalogs, telephone directories, parts lists, and other reference tools.

Applications of CD-ROM

CD-ROM has many applications due to its capacity for storing volumes of information in a small space, and for providing local access to this information as many times as required. Examples of interest to educators include encyclopedias and multi-volume dictionaries, bibliographic databases, library catalogs, and other reference tools.

Grolier's Electronic Encyclopedia, a CD-ROM version of their *Academic American Encyclopedia,* was the first of its kind. The price of the encyclopedia and software required to access it is $398. Although subject to change, one may note that this is comparable to the cost of the print version. To be available in 1987, the *Oxford English Dictionary* is in the process of being converted to CD-ROM.

Large bibliographic databases, such as ERIC (Educational Resources Information Center), Medline, Psychological Abstracts, NTIS (National Technical Information Service), Compendex, Disclosure, Dissertation Abstracts, and the family of Wilson indexes *(Reader's Guide, Applied Science and Technology Index, Library Literature,* etc.), among others, are now available from a variety of CD-ROM producers including Dialog, OCLC, SilverPlatter, H. W. Wilson, and University Microfilms International.

New developments in access software will link multiple drives to allow complete databases covering many years on multiple disks to be searched from one computer. Other systems allow dial-up access to the complete database online for restrospective searches and for access to the most recent updates. Dialog OnDisc products and Wilsondisc are examples of these systems.

Library catalogs on CD-ROM are being provided through Brodart's Le Pac system and the Library Corporation's BiblioFile system, with new products entering the market almost daily.

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Other tools on CD-ROM include Bowker's *Books in Print* and *Ulrich's Plus*, which are used for verifying and acquiring new materials. Suppliers of library materials are also putting their catalogs on CD-ROM to assist in the library automation process.

An example of new developments in information delivery, Microsoft's *Bookshelf* makes 10 heavily used reference tools available on the same disk, including an almanac, a dictionary, a thesaurus, *Bartlett's Familiar Quotations, The Chicago Manual of Style*, and the zip code directory. Users will be able to insert information from these tools directly into word processing operations.

Issues and Concerns

Due to the relatively high cost of mastering CD-ROM disks, the most appropriate type of information for CD-ROM storage is that which is not likely to change quickly. An encyclopedia that is updated annually in print form is a good application for CD-ROM. Stock prices, which change very frequently, are not a good application. Databases, like ERIC, are usually updated quarterly on CD-ROM.

Information cannot be added to or erased from CD-ROM disks, hence the name "read only memory." The development of new optical disks such as WORM (Write Once, Read Many) and DRAW (Direct Read After Write) will probably bring about changes in the CD-ROM marketplace. These products are not currently available in the educational market and there is uncertainty as to where new developments will lead. Many publishers are tentative about committing resources to CD-ROM development when other new technologies are near to availability.

CD-ROM drives are used as peripherals to microcomputers and may not be used in a network environment at this time. Each microcomputer to be used as a workstation must have its own CD-ROM drive, making the cost of a workstation $700-$1,000 higher. New developments in local area network software are bringing about changes in this situation.

Another area of concern deals with standards. Users and developers will benefit from consistency in the way that information is stored and accessed on various CD-ROM products. Standards are still being developed at this time for both the format of data on the disk and the means of accessing the data. Organizations involved in the development of standards include NISO (National Information Standards Organization), ANSI (American National Standards Institute), and the High Sierra Group, a group of CD-ROM industry representatives. NISO issued its first proposed standard, *Volume and File Structure of Read Only Optical Disks for Information Interchange* in late 1986, with ratification expected in early 1987.

Trends

Developments in CD-ROM technology that will make the technology more useful include local area networks for more than one computer to access a single CD-ROM drive, multi-drive units that will enable a user to search a multi-disk database without switching disks, half-height drives that will fit in the space of a floppy drive, and security features to prevent removal of the disk.

WORM technology will enable users to add local data to prerecorded disks, but it may not be altered once written. In DRAW technology, each disk is created individually, with error control taking up considerable space on the disk. Other technologies in development include programmable and erasable disks.

Another new technology in development based on CD-ROM is CD/I, or Compact Disk/Interactive, a consumer electronic product. Being designed as a stand-alone computer system to be connected to a television set, CD/I will deliver audio, computer programs, and text, such as how-to-do-it guides, still video, and animation; it is not designed to handle motion video. It is not yet commercially available.

Publishers/Producers of CD-ROM

Bowker Electronic Publishing
205 E. 42nd Street
New York, NY 10017
(800) 521-8110

Brodart Company
500 Arch Street
Williamsport, PA 17705
(800) 233-8467

Dialog Information Services
3460 Hillview Avenue
Palo Alto, CA
(800) 334-2564

Grolier Electronic Publishing
Sherman Turnpike
Danbury, CT 06816
(800) 243-7256
(203) 797-3500

Library Corporation
P.O. Box 40035
Washington, DC 20016
(800) 624-0559

Microsoft Press
16011 NE 36th Way
Box 97017
Redmond, WA 98073
(206) 282-8080

OCLC, Inc.
6565 Frantz Road
Dublin, OH 43017
(614) 764-6000

SilverPlatter Information Inc.
37 Walnut Street
Wellesley Hills, MA 02181
(617) 239-0306

University Microfilms International
300 North Zeeb Road
Ann Arbor, MI 48106
(800) 521-0600
(313) 761-4700

H. W. Wilson Company
950 University Avenue
Bronx, NY 10542
(800) 367-6770
(800) 462-6060 (in NY)

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This report was prepared by Pamela McLaughlin, User Services Coordinator of the ERIC Clearinghouse on Information Resources, Syracuse University. September 1987.

This publication was prepared with funding from the Office of Educational Research and Improvement, U.S. Department of Education, under contract no. 400-85-0001. The opinions expressed in this report do not necessarily reflect the positions or policies of OERI or ED.